**Woen-Sug Choi**

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# Profile

* Highly self-motivated Ph.D. candidate with demonstrated research expertise analysis of flow-induced noise and vibration incorporating CFD calculations. Strong interpersonal skills and research project managements.
* Rich experience in modeling and simulating using OpenFOAM and in-house aeroacoustics, structure solver modules.
* Experience in multibeam sonar simulation plugin developments using GPU acceleration and dynamics/kinematics plugins for underwater gliders at ROS-Gazebo platform for autonomous robotics
* Strong adaptation to different programming languages. (First learned Visual Basic programming at age of 9)
* Language: Fluent in Korean (Native), English (Graduated middle school in San Antonio, Texas, USA), and Japanese.
* US residency experience : 9th grade at Rogers high school, Newport, RI (3 years grade skipping at age of 13)
* Member of a military family
* Father : former submarine captain and naval attaché to USA retired as a rear admiral at Republic of Korea Navy.
* Brother : Served Republic of Korea Marine Corps
* Myself : Served as Technical Research Personnel for Republic of Korea Army

# Education

July. 2020 ~ **Naval Postgraduate School** (Postdoctoral Researcher)Monterey, CA, USA

Present *CRUSER (Consortium for Robotics and Unmanned Systems Education and Research)*

*NRC Research Associateship Award* *(Research Associate Program)*

(Developments of virtual underwater acoustic environments and test and evaluation platforms for robotic autonomous systems, PI : Prof. Brian Bingham)

Mar. 2020 ~ **Center for Naval Ship Engineering** (Postdoctoral Senior Researcher)Seoul, Korea

June. 2020Institute of Engineering Research, Seoul National University

Mar. 2013 ~ **Seoul National University** (Integrated Ph.D. Program)Seoul, Korea

Feb. 2020Department of Naval Architecture and Ocean Engineering, Ship Noise and Vibration Laboratory

Thesis: Development of numerical analysis methods for flow-induced noise due to turbulent flows around underwater structures

Advisor: Prof. Suk-Yoon Hong

Mar. 2009 ~ **Yokohama National University** (Korea-Japan Joint Government Scholarship Program) Yokohama, Japan

Feb. 2013Department of Mechanical Engineering and Materials Science, Digital Engineering Laboratory

Thesis: Constrained B-spline surface fitting by iterative geometric approximation algorithm

Advisor: Prof. Takashi Maekawa

*Bachelor of Science in Mechanical Engineering and Materials Science (Machine processing course)*

# Research Interest

* **Computational aeroacoustics/hydroacoustics and vibroacoustics**
* Modeling and simulation of flow-induced noise and vibration
* Turbulence models of computational fluid dynamics and application of computational acoustics
* **Fluid-structure interaction analysis**
* Predictions of vibration and noise excited by turbulent boundary layers and turbulent flows
* Simulation of flow-induced resonance behavior such as frequency lock-in phenomenon and safety boundaries.
* **Automonous robotics simulations**
* Kinematics and dynamics of underwater vehicles
* Simulation multibeam sonar using GPU accelerations

# Awards

* **NRC Research Associateship Award –** *Research Associateship Programs* July. 2020 ~ Present

*The National Research Council of the National Academies, USA*

‘Developments of virtual underwater acoustic environments and test and evaluation platforms for robotic autonomous systems’ at Naval Postgraduate School in Monterey, California, USA

# Research Experiences

* **Researcher (PM) –** *Developments of virtual underwater acoustic environments* July. 2020 ~ Present

*and test and evaluation platforms for robotic autonomous systems* (Funded by NRC and NPS)

* Development of multibeam sonar for underwater applications using GPU accelerations to support real-time simulation of autonomous vehicles. Kinematics/dynamics plugins for underwater gliders in ROS-Gazebo platform. (<https://github.com/Field-Robotics-Lab/DAVE>)
* **Researcher (PM) –** *Developemnt of vibrational response prediction methods for* Mar. 2019 ~ June. 2020

*underwater structures excited by wake considering fluid-structure interactions*

(Funded by Hyundai Heavy Industries)

* Development of prediction methods for vibrational response of self-excited lifting bodies with hybrid coupling FSI analysis to simulate frequency lock-in and effect of trailing edge designs to its characteristics.
* **Researcher (PM)** – *Future Submarine Low Noise Propeller Specialized Laboratory* Oct. 2018 ~ June. 2020

(With Korea Research Institute of Ships & Ocean Engineering funded by Agency for Defense Development)

* Broadband noise predictions of marine propellers induced by turbulent boundary layer using wall pressure spectrum models with available RANS CFD results.
* **Researcher (PM) –** *Research on engineering requirements of next generation advanced* April. 2018 ~ Dec. 2018

*navy ships and acquisition considerations for core equipment*

(With Daewoo Shipbuilding and Marine Engineering funded by Republic of Korea Navy)

* Conceptual design calculation methods development and literature research for future advanced navy ship equipment requirements including acquisition consideration and planning.
* **Researcher (PM) –** *Research on technical counterplans for future propulsion systems* Aug. 2017 ~ Dec. 2017

(Funded by Republic of Korea Navy)

* Conceptual design calculation methods development and literature research for future propulsion systems including pump-jet propulsions and noise attenuations at sea.
* **Researcher –** *Development of performance assessment methods for perforated noise* Aug. 2017 ~ Dec. 2017

*absorption structures in high flow environments*(Funded by Hyundai Electronics)

* Estimation of noise produced by perforated structures in flow environments
* **Researcher (PM, Representative)** – *Advanced Naval Vessels Research Laboratory*June. 2013 ~ Dec. 2017

(Funded by Agency for Defense Development and Daewoo Shipbuilding and Marine Engineering)

* Turbulence-induced noise analysis of ship appendages using acoustic analogy and turbulent boundary layer excited vibro-acoustic response analysis for ship hull designs using empirical wall pressure spectrum models and Energy flow analysis methods.
* **Researcher** – *Underwater self-noise analysis modeling and measurements*June. 2014 ~ June. 2015

(Funded by Agency for Defense Development)

* Calculation of flow-induced noise generated at the head of torpedoes

# Publications

1. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, J.-H Choi, S.-G. Lee, I.-R. Park, H.-S. Seol, and M.-J. Kim, “[Time domain broadband noise predictions for non-cavitating marine propellers with wall pressure spectrum models](javascript:void(0))”, *International Journal of Naval Architecture and Ocean Engineering*,**13**, 75-85, (2021). **SCI**
2. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, J.-H, “Numerical simulation of lock-in phenomenon and using hybrid-coupling fluid-structure interaction analysis methods for rudder designs”, *in preparation.*
3. **W. –S. Choi**, S. -Y. Hong, H.-W. Kwon, J.-W. Seo, S.-H. Rhee, and J.-H. Song, “Estimation of turbulent boundary layer induced noise using energy flow analysis for ship hull designs”, *Journal of Engineering for the Maritime Environment*, **234**, 1, 196-208,(2020). **SCI**
4. **W. –S. Choi**, S. -J. Jeong, S.-Y. Hong, J.-H. Song, H.-W. Kwon, and M.-J. Kim, “Predictions of Broadband Noise for non-cavitation hydrofoils using wall pressure spectrum models”, **25**, 6, 765-771, (2019). KCI,In Korean.
5. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, J.-W. Seo, and S.-H. Rhee, “Analysis of hull-induced flow noise characteristics for wave-piercing hull forms”, *Journal of the Korean Society of Maritime Environment & Safety*, **24**, 5, 619-627, (2018). KCI, In Korean
6. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, “Prediction of turbulent boundary layer noise on plate using energy flow analysis”, *Transactions of the Korean Society for Noise and Vibration Engineering*, **27**, 5, 608-615, (2017). KCI, In Korean
7. Y.-S. Choi, **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, H.-S. Seol, and C.-M. Jung, “Development of formulation Q1As method for quadrupole noise prediction around a submerged cylinder”, *International Journal of Naval Architecture and Ocean Engineering*,**9**, 5, 484-491, (2017). **SCI**
8. **W. –S. Choi**, Y.-S. Choi, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and H.-S. Seol, “Experimental investigation of noise generated by submerged circular cylinder”, *Noise Control Engineering Journal*,**65**, 4, 288-294, (2017). **SCI**
9. **W. –S. Choi**, Y.-S. Choi, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, “Turbulent-induced noise of a submerged cylinder using a permeable FW-H method”, *International Journal of Naval Architecture and Ocean Engineering*,**8**, 3, 235-242, (2016). **SCI**
10. J.-Y. Kim, **W. –S. Choi**, S. -Y. Hong, H.-G. Chung, J.-H. Song, W.-S. Im, and H.-W. Kwon, “A Study on Efficient Test & Evaluation Methods in Naval Ship Acquisitions”, *Journal of the Korea Institute of Military Science and Technology*,**19**, 6, 703-711, (2016). KCI, In Korean
11. Y.-S. Choi, S. -Y. Hong, J.-H. Song, H.-W. Kwon, **W. –S. Choi**, and C.-M. Jung, “Turbulent-induced noise of 2-dimensional sonar dome shaped structure”, *Transactions of the Korean Society for Noise and Vibration Engineering*, **26**, 1, 39-48, (2016). KCI, In Korean
12. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, “Turbulent-induced noise around a circular cylinder using permeable FW-H methods”, *Journal of the Korean Society of Marine Environment & Safety*,**20**, 6, 752-759, (2014). KCI, In Korean

# International Conferences (First Author list only)

1. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, and H.-W. Kwon, “Turbulent boundary layer noise analysis using energy flow analysis”, NOVEM2018, Ibiza, Spain, (2018) – oral.
2. **W. –S. Choi**, S. -Y. Hong, T.-G. Kim, Y. Choi, J.-H. Song, and H.-W Kwon, “Turbulent-induced noise of underwater submerged bodies for hydrodynamic design”, IMDC2015, Tokyo, Japan, (2015) – oral.
3. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, “Turbulent-induced noise around a circular cylinder using permeable FW-H methods”, NAA2015, Shanghai, China, (2015) – oral.

# Domestic Conferences (First Author list only)

1. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, J.-H Choi, S.-G. Lee, I.-R. Park, H.-S. Seol, and M.-J. Kim, “Predictions of non-cavitation broadband noise for underwater propellers”, KSNVE2019, Jeju, Korea (2019) – oral.
2. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, M.-J. Kim, and K.-C. Lee, “Numerical study on non-cavitation broadband noise for hydrofoil”, KIMST2018, Daejeon, Korea (2018) – oral.
3. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, “Turbulent-induced noise prediction methods for high-speed future naval ships”, KIMST2017, Daejeon, Korea (2017) – oral.
4. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, “A study on characteristics of turbulent boundary layer noise using fluid-structure interaction analysis”, KSNVE2017, Kwangju, Korea (2017) – oral.
5. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and C.-M. Jung, “Characteristics of turbulent-induced noise for naval ship appendages”, KSOE2014, Busan, Korea (2014) – oral.
6. **W. –S. Choi**, S. -Y. Hong, J.-H. Song, H.-W. Kwon, and Y.-L. Jung, “Turbulent-induced noise for underwater submerged bodies”, KSOE2014, Busan, Korea (2014) – oral.

# Major courses

* Engineering Acoustics
* Ship Noise and Vibration Measurements and Analysis
* Fundamentals of Underwater Acoustics
* Noise Control Engineering
* Turbulent Flows
* Advanced Computational Fluid Dynamics (Discretizations of Compressible Euler and Navier-Stokes Eqn.)
* Advanced Computational Fluid Dynamics (Basic Elements and Scalar Conservation Laws)
* Numerical Analysis in Mechanical Engineering
* Computational Fluid Dynamics for Turbulent Ship Flows